

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number  
WO 01/60220 A1

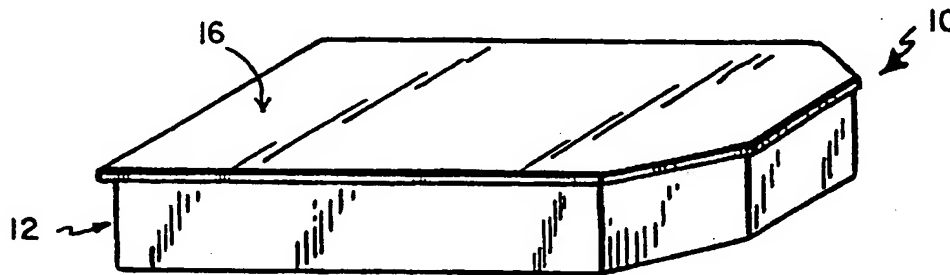
- (51) International Patent Classification<sup>7</sup>: A47J 31/06, B65D 81/00
- (21) International Application Number: PCT/US01/04723
- (22) International Filing Date: 14 February 2001 (14.02.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/183,569 18 February 2000 (18.02.2000) US  
09/782,665 13 February 2001 (13.02.2001) US
- (71) Applicant: KEURIG, INCORPORATED [US/US]; 101 Edgewater Drive, Wakefield, MA 01880 (US).
- (72) Inventors: LAZARIS, Nicholas, G.; 1947 Beacon Street, Newton, MA 02468 (US). BEAULIEU, Roderick, H.; 196 Hines Road, Cumberland, RI 02864 (US).
- (74) Agents: GAUTHIER, Maurice, E. et al.; Samuels, Gauthier Stevens, Suite 3300, 225 Franklin Street, Boston, MA 02110 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE



(57) Abstract: A beverage filter cartridge comprises an outer container (12) with an access opening. A filter element (14) is received in and configured and arranged to subdivide the interior of the container into first and second chambers (A, B). A beverage medium is stored in the first chamber (A). A lid (16) closes the access opening. The lid has a first section overlying the first chamber (A) and a second section overlying the second chamber (B). The first section of the lid is yieldably piercable to accommodate an inflow of liquid into the first chamber for infusion with the beverage medium to produce a beverage. The filter element is permeable to accommodate a flow of the beverage from the first chamber into the second chamber, and the second section of the lid (16) is yieldably piercable to accommodate an outflow of the beverage from the second chamber to the exterior of the cartridge.

WO 01/60220 A1

## DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE

CROSS REFERENCES TO RELATED APPLICATIONS

5        This application claims priority from Provisional Patent Application Serial No. 60/183,569 filed 02/18/2000 and U.S. Utility Patent Application Serial No. 09/782,665 filed on 02/13/2001, both of which are incorporated herein by reference in their entirety.

10

FIELD OF THE INVENTION

      This invention relates to disposable single serve beverage filter cartridges.

15

DESCRIPTION OF THE PRIOR ART

      A known disposable single serve beverage filter cartridge is disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189 (Sylvan et al), dated respectively July 5, 1994 and November 24, 1998. This beverage filter cartridge is comprised basically of an  
20 impermeable yieldably piercable cup-shaped container thermoformed or injection molded from a relatively rigid plastic material, and internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid comprising a laminate  
25 of metallic foil and plastic.

      During a brewing cycle, the lid and container bottom are pierced from opposite directions, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from  
30 which it exits via the outlet probe for delivery to an underlying cup.

      This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding certain problems and disadvantages relating to its use that have persisted since its initial introduction.

For example, as compared to the lid, the bottom of the cup-shaped container is relatively thick, with a higher resistance to piercing. The bottom cannot easily be thinned without adversely affecting the required thickness of the cup's sidewall to prevent permeability to oxygen and the ability to connect the filter material to the  
5 sidewall without damaging the oxygen barrier material. Thus, in the course of being punctured by the outlet probe, the bottom exhibits a tendency to distort inwardly, with an accompanying buckling of the container sidewall. Bottom distortion accompanied by sidewall buckling can adversely affect the puncturing process, resulting in leakage around the outlet probe.

- 10 A related problem stems from the need to equip the brewers with expensive metallic outlet probes that can be sharpened to the extent necessary to effect piercing of the more resistant container bottoms, and that can resist wear over prolonged periods of use.

Additionally, some of the brewed liquid beverage is not able to be evacuated  
15 because the outlet probe opening is above the bottom of the container and some of the beverage has no means of drainage.

What is needed, therefore, is an improved beverage filter cartridge that obviates or at least significantly minimizes the above-noted problems and disadvantages.

20

#### SUMMARY OF THE INVENTION

In accordance with the present invention, a beverage filter cartridge includes an impermeable outer container having an access opening. A planar filter element is  
25 configured and arranged to subdivide the container interior into first and second chambers. A beverage medium is stored in the first chamber and an impermeable lid closes the access opening.

The lid has a first section overlying the first chamber and a second section overlying the second chamber. The first and second lid sections are yieldably  
30 piercable, respectively, from the same direction, by single or multiple inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter element into the second chamber, from which it exits via the outlet probe.

The lid material has a lesser resistance to being yieldably pierced as compared to the resistance of the container bottom, and is thus less prone to inward distortion with accompanying buckling of the container sidewall. The net result is a cleaner puncture and an improved seal around the outlet probe.

5       The relative ease with which the lid may be pierced also makes it possible to equip the brewers with less expensive plastic inlet and outlet probes, in single or multiple configurations.

These and other features and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

10

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of one embodiment of a beverage filter cartridge  
15 in accordance with the present invention;

Figure 2 is a top plan view of the beverage filter cartridge shown in Figure 1, with portions of the lid and filter element broken away to illustrate details of the container interior;

Figure 3 is a sectional view on an enlarged scale taken along line 3-3 of Figure  
20 2;

Figure 4 is an exploded view of the basic components comprising the beverage filter cartridge shown in Figures 1-3;

Figure 5 is a cross sectional view similar to Figure 3 showing the lid of the beverage filter cartridge punctured by inlet and outlet probes during a beverage  
25 brewing cycle;

Figure 6 is a perspective view of another embodiment of a beverage filter cartridge in accordance with the present invention;

Figure 7 is an exploded view of the basic components of the beverage filter cartridge shown in Figure 6;

30       Figure 8 is a side view of the beverage filter cartridge looking in the direction of arrow "X" in Figure 6;

Figures 9, 10, 11 and 12 are sectional view on an enlarged scale taken respectively along lines 9-9, 10-10, 11-11 and 12-12 of Figure 8; and

Figure 13 is a sectional view similar to Figure 10 showing the lid of the beverage filter cartridge punctured by inlet and outlet probes during a beverage brewing cycle.

5

#### DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Referring initially to Figures 1-5, one embodiment of a beverage filter cartridge in accordance with the present invention is generally depicted at 10. The beverage filter cartridge includes an impermeable outer container 12, a permeable filter element 14, and an impermeable lid 16.

The outer container 12 is generally tray-shaped with a bottom wall 12a, a side wall 12b with a flat rim 12c surrounding an access opening 13, and a plurality of laterally spaced support ribs 12d projecting upwardly from the bottom wall and 15 extending in parallel relationship in the lengthwise direction of the container.

As shown in Figure 3, the ribs 12d join the sidewall 12b at 18, curve downwardly and then extend in parallel relationship to the bottom 12a before again curving upwardly to terminate as at 20.

The filter element 14 is formed from sheet material shaped to conform to the 20 shape of the upper edges of the support ribs. The filter element is received in the container 12, with the edges 14a of its front and back ends overlapping and sealed to the rim 12c of the container side wall 12b, and with the edges 14b of its sides overlapping and sealed to outermost ribs 12d which are formed integrally with the container side wall. When thus positioned, the filter element defines a first chamber 25 "A" separate from a second chamber "B", the latter being in communication with open channels separating the support ribs 12d.

A beverage medium "M", typically roasted ground coffee, is loaded into chamber A, after which the lid 16 is sealed to the rim 12c of the container wall 12b (and to any overlapping sealed edge portions of the filter). When thus positioned, the 30 lid has a first section 16a overlying chamber A, and a second section 16b overlying chamber B.

The outer container may be formed, typically by injection molding, from an impermeable heat sealable material.

The filter element 14 may be cut or blanked from any suitably pliable, permeable and yieldably piercable sheet material, a preferred example being cellulose polypropylene supplied by J.P. Crompton, Ltd. of Bury, Lancashire, England. The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably piercable material, a preferred example being a metallic/polymer laminate supplied by Heat Seal-Winpak, Ltd. of Montreal, Canada. The lid has less resistance to being yieldably pierced as compared to the outer container, which may or may not be yieldably piercable.

During a brewing cycle, as shown in Figure 5, the cartridge can be oriented vertically, and the lid 16 is pierced with one or more tubular infusion probes 22 to admit hot water under pressure into chamber A for infusion with the beverage medium M. The resultant beverage passes through the filter element 14 into the channels defined between the support ribs 12d. From here, the beverage flows downwardly into chamber B from which it is extracted by one or more tubular exit probes 24 which pierce the lid and filter element at a location overlying chamber B. The probes 22, 24 are oriented in the same direction to operate on one side of the cartridge, without piercing the outer container. The soluble beverage medium is completely soaked because the rate of hot water being injected into the container is greater than the outflow rate provided by the outlet probes, resulting in the second chamber B becoming filled with beverage extract and forcing the first chamber A to become completely filled with hot water.

Although not shown, it will be understood that the cartridge may be oriented in other ways than as illustrated in Figure 5 before, during or after the brewing process.

A second embodiment of a beverage filter cartridge in accordance with the present invention is generally depicted at 30 in Figures 6-13. The cartridge components are illustrated separately in Figure 7, and include an outer container 32, a planar filter element 34, and a lid 36.

The container 32 has a bottom wall 38, a front wall 40, a back wall 42, and side walls 44, 46. The front, back and sidewalls extend upwardly from the bottom wall to a peripheral rim 48 surrounding an upper opening 50.

The side walls 44, 46 are appropriately contoured to define generally V-shaped ledges 52 extending between the front and back walls 40, 42, with the lower portions of the ledges 52 being spaced above the container bottom 38. The bottom 38 is

preferably contoured to provide an upwardly protruding centrally located boss 54.

The back wall 42 is contoured and the upper rim 48 is recessed to provide a well 56 opening towards the interior of the container.

The filter element 34 has front and back edge regions 34a, 34b, and side edge regions 34c. The filter element is configured, dimensioned and operatively positioned to subdivide the interior of the container into first and second chambers "A", "B", with the well 56 opening into and forming part of chamber B. When the filter element is thus positioned, it will be understood that its side edge regions 34c are secured as by heat sealing to the ledges 52 of the side walls 44, 46, and the front and back edge regions 34a, 34b are similarly secured to the front and back walls 40, 42. Preferably, the bottom of the filter element is also secured as by heat sealing to the upwardly protruding boss 54.

A beverage medium "M" is received through the upper opening 50 and stored in the first chamber A. The upper opening is then closed by securing the lid 36, as by heat sealing, to the peripheral container rim 48.

The outer container may be formed from impermeable heat sealable materials, a preferred example being polyethylene/EVOH/polystyrene supplied by Curwood Flexible Packaging of Oshkosh, Wisconsin, U.S.A.

The materials from which the filter element 34 and lid 36 are formed may be the same as those described previously for the filter element 14 and lid 16 of the first embodiment.

The lid 36 has a first section 36a overlying chamber A, and a second section 36b overlying the well 56.

As shown in Figure 13, at the onset of a brewing cycle, the lid section 36a is pierced by one or more inlet probes 58, and the lid section 36b and underlying portion of the filter element are pierced by an outlet probe 60. The inlet probe admits heated liquid into chamber A for infusion with the beverage medium M, and the resulting brewed beverage passes through the filter element into chamber B from which it exits via the outlet probe 60.

It will thus be seen that in both embodiments, the outer container is not pierced. Rather, liquid communication is established with the separate chambers A, B by inlet and outlet probes operating from the same side of the cartridge to pierce different sections of the readily piercable lid.

Although the outer container and lid have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will  
5 preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

We claim:



1        1.     A beverage filter cartridge comprising:  
2        an outer container having an access opening:  
3        a permeable filter element received in and configured and arranged to subdivide  
4 the interior of said container into first and second chambers;  
5        a soluble beverage medium stored in said first chamber; and  
6        a lid closing said access opening, said lid having a first section overlying said  
7 first chamber and a second section overlying said second chamber, the first section of  
8 said lid being yieldably piercable to accommodate an inflow of liquid into said first  
9 chamber for infusion with the beverage medium to produce a beverage, said filter  
10 element being permeable to accommodate a flow of the beverage from said first  
11 chamber into said second chamber, and the second section of said lid being yieldably  
12 piercable to accommodate an outflow of the beverage from said second chamber to the  
13 exterior of said cartridge.

1        2.     The beverage filter cartridge of claim 1 wherein said lid has less  
2 resistance to being yieldably pierced as compared to that of said container.

1        3.     The beverage filter cartridge of claim 1 wherein said filter element is  
2 yieldably piercable.

1        4.     The beverage filter cartridge of claim 1 wherein a first section of said  
2 filter element coacts with interior surfaces of said container to define said first  
3 chamber, and a second section of said filter element underlies the second section of  
4 said lid.

1        5.     The beverage filter cartridge of claim 1 wherein said container is  
2 provided with a flat rim surrounding and projecting outwardly from, said access  
3 opening, and wherein edge segments of said filter element overlap and are heat sealed  
4 to segments of said rim.

1        6.     The beverage filter cartridge of claim 4 wherein the second sections of  
2 both said lid and said filter element are yieldably piercable to accommodate the  
3 beverage outflow from said second chamber.

1        7.     The beverage filter cartridge of claim 1 wherein said filter element  
2 comprises a planar sheet of permeable yieldably piercable material.

1        8.     The beverage filter cartridge of claim 1 wherein said outer container is  
2 impermeable.

1        9.     The beverage filter cartridge of claims 1 or 8 wherein said lid is  
2 impermeable.

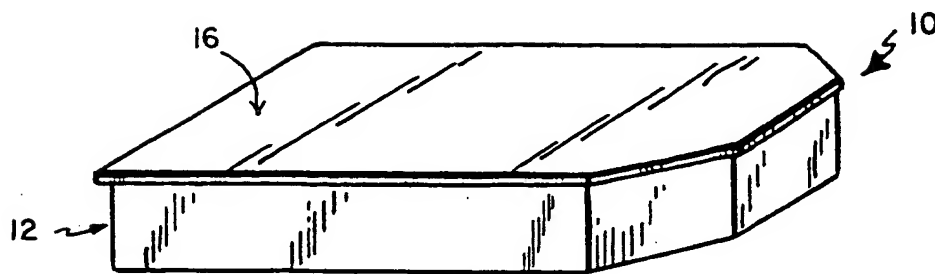


FIG. 1

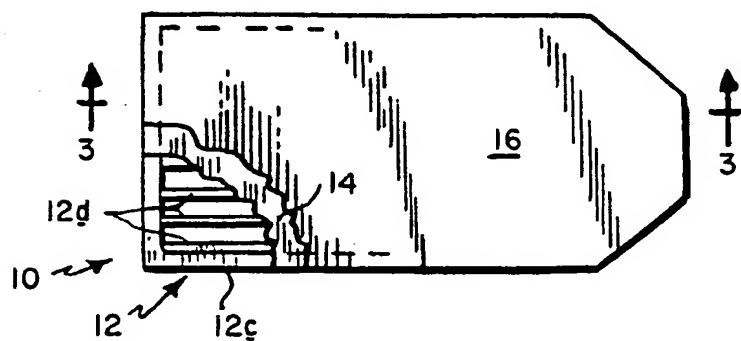


FIG. 2

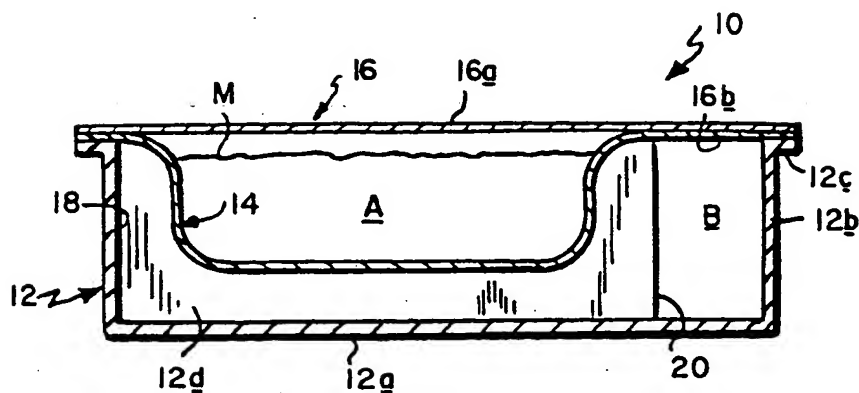
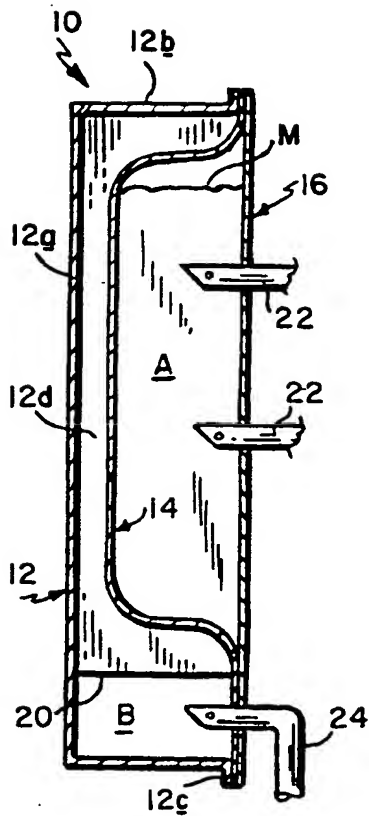
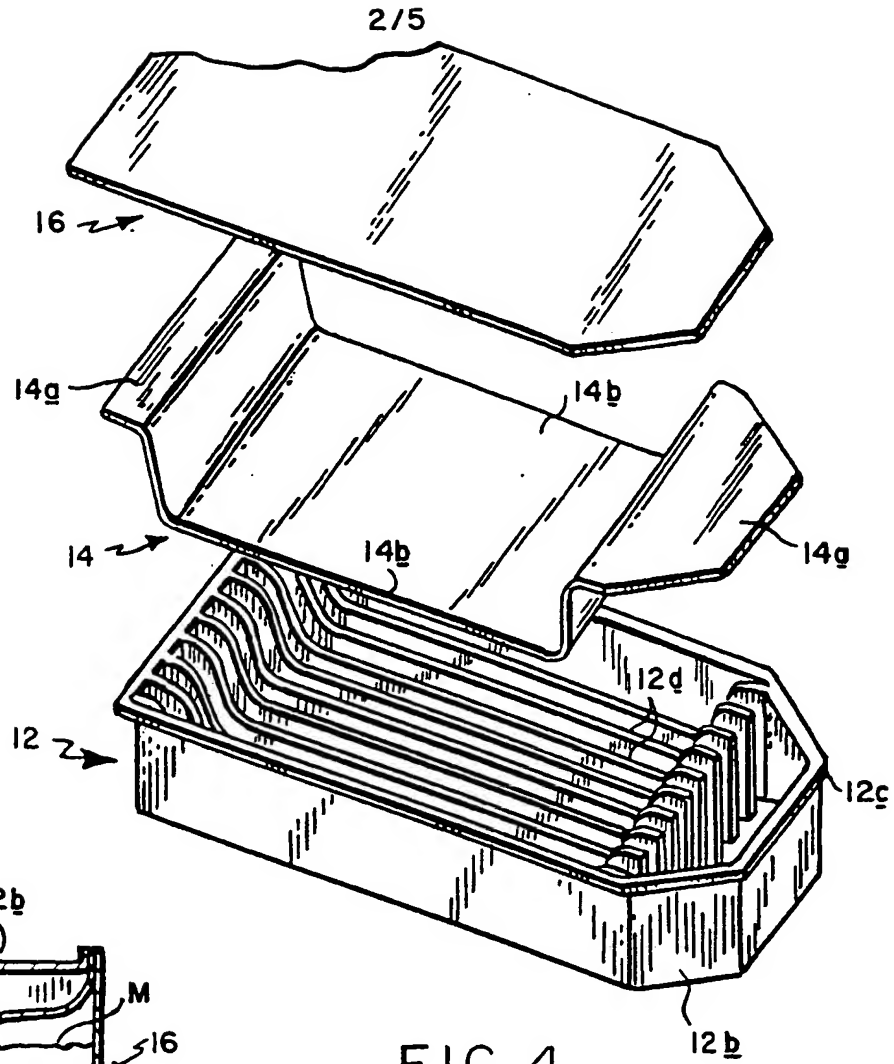


FIG. 3



3 / 5

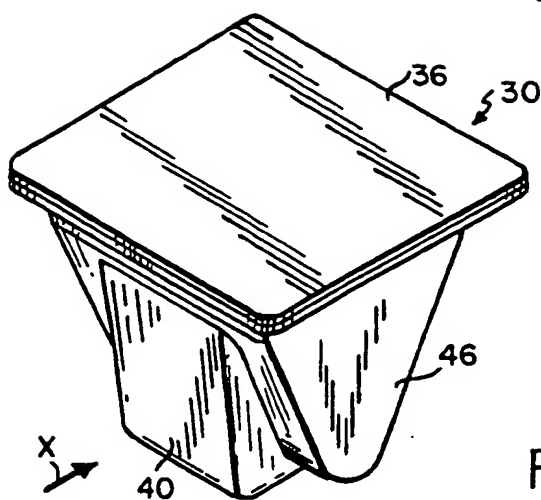


FIG. 6

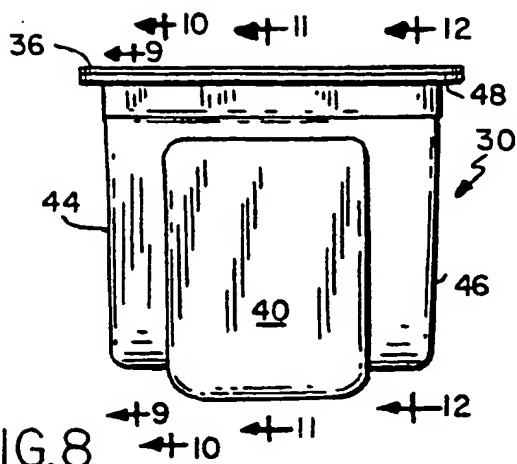
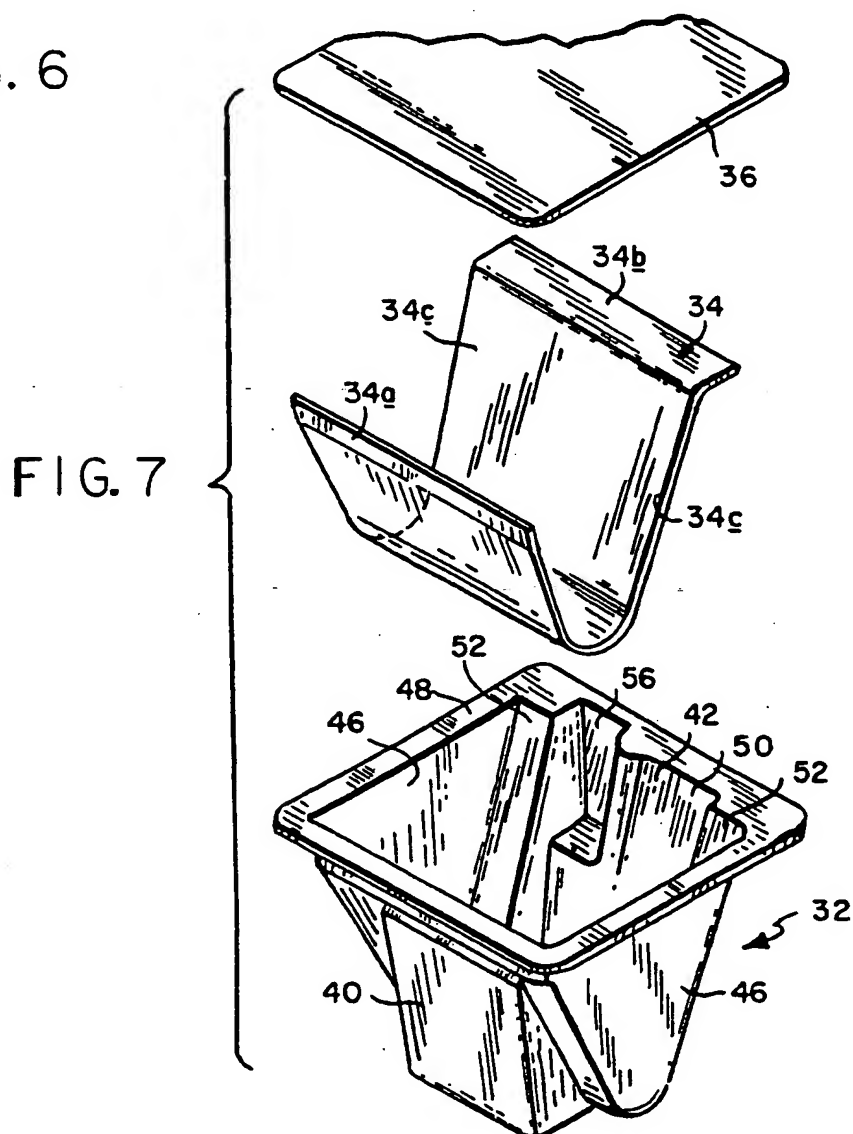


FIG. 8



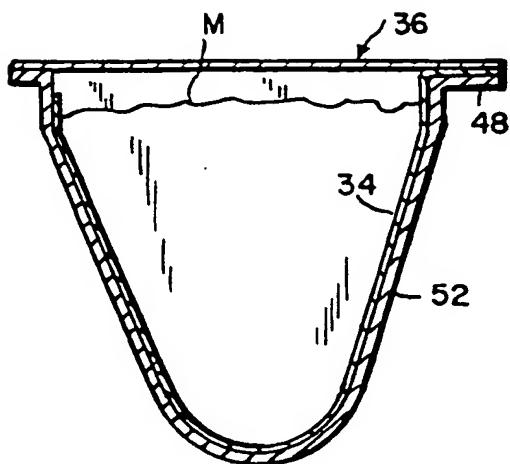


FIG. 9

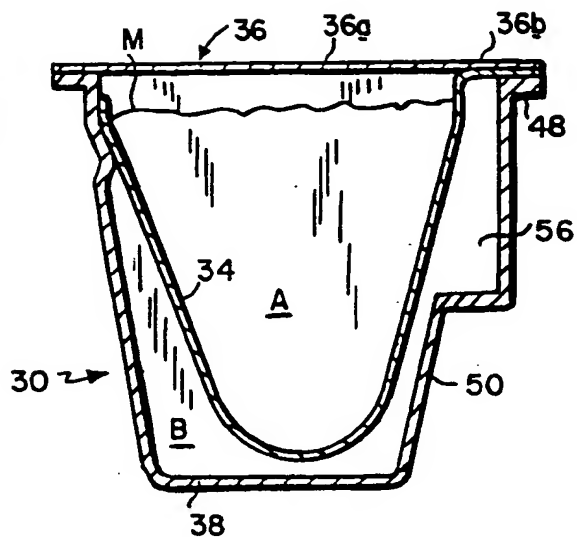


FIG. 10

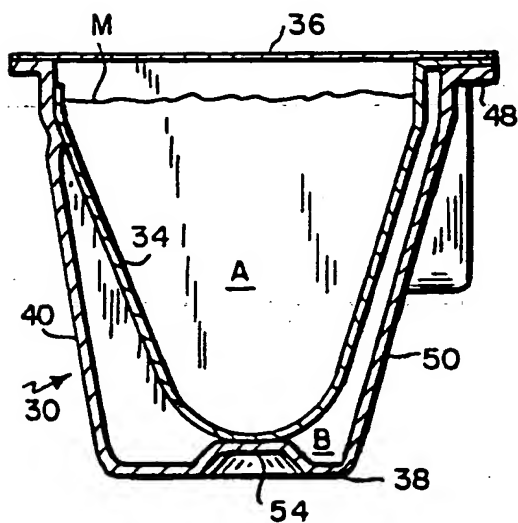


FIG. 11

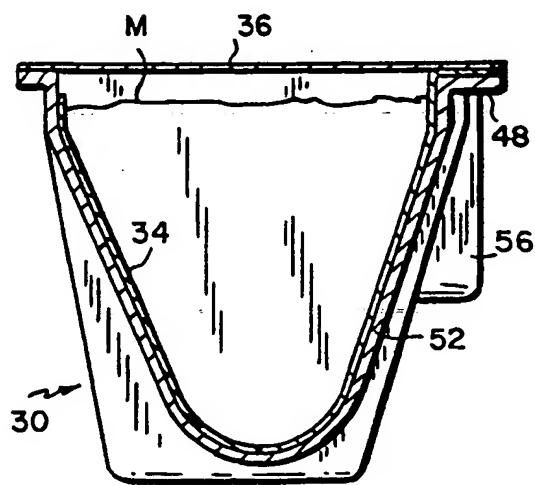


FIG. 12



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/04723

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A47J31/06 B65D81/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47J B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 325 765 A (SYLVAN JOHN E ET AL) 5 July 1994 (1994-07-05) cited in the application the whole document	1
A	US 5 840 189 A (SYLVAN JOHN E ET AL) 24 November 1998 (1998-11-24) cited in the application the whole document	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

16 May 2001

Date of mailing of the international search report

23/05/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.  
Fax: (+31-70) 340-3016

Authorized officer

Van der Plas, J



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/04723

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5325765 A	05-07-1994	US 5840189 A	24-11-1998
US 5840189 A	24-11-1998	US 5325765 A	05-07-1994